



2819

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Applicant: K.A. Schouhamer IMMINK Conf.: 9133
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For: METHOD AND APPARATUS FOR CODING
INFORMATION, METHOD AND APPARTUS FOR
DECODING INFORMATION, METHOD OF
FABRICATING A RECORDING MEDIUM, THE
RECORDING MEDIUM AND MODULATED SIGNAL

LETTER

Assistant Commissioner for Patents
Washington, DC 20231

June 7, 2001

Sir:

Under the provisions of 35 U.S.C. § 119 and 37 C.F.R. § 1.55(a), the applicant(s) hereby claim(s) the right of priority based on the following application(s):

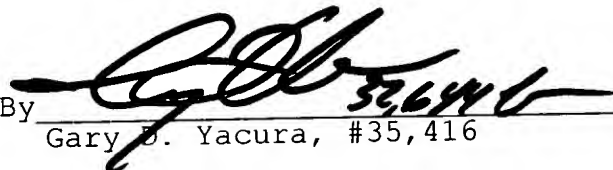
<u>Country</u>	<u>Application No.</u>	<u>Filed</u>
Europe	99203739.0	November 11, 1999

A certified copy of the above-noted application(s) is(are) attached hereto.

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Respectfully submitted,

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Attachment

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Patentanmeldung Nr. Patent application No. Demande de brevet n°

99203739.0

Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

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**Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation**

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Application no.: 99203739.0
Demande n°:

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Anmelder:
Applicant(s):
Demandeur(s):
Schouhamer Immink, K. A.
5664 AN Geldrop
NETHERLANDS

Bezeichnung der Erfindung:
Title of the invention:
Titre de l'invention:

**Method of converting a series of m-bit information words to a modulated signal and vice versa,
coding device as well as decoding device**

In Anspruch genommene Priorität(en) / Priority(ies) claimed / Priorité(s) revendiquée(s)

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Titl

09. 11. 1999

Method of converting a series of m-bit information words to a modulated signal and *vice versa*, coding device as well as decoding device.

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BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a method of encoding and decoding a series of m-bit information words into a series of n-bit code words according to conversion rules so that the series of code words satisfies a predetermined criterion, and in particular, to a so-called (d,k)-constraint, where said encoded sequence of n-bit code words complies with the constraint that each "1" of the encoded sequence is followed by at least d "0"s and at most k "0"s, where d and k are positive integers, and where k exceeds d, and the series of said n-bit code words are converted into a modulated signal.

The invention further relates to an apparatus for performing the method as claimed, this device comprising an m-to-n converter for converting the m-bit information words into n-bit code words, and means for converting the series of n-bit code words into a modulated signal.

2. Description Relative to the Prior Art

Run length limited codes, generically designated as (d, k) codes, have been widely and successfully applied in modern magnetic and optical recording

systems. Such codes, and means for implementing said codes are described by K. A. Schouhamer Immink in the book entitled "Coding Techniques for Digital Recorders" (ISBN 0-13-140047-9). Run length limited codes are extensions of earlier non return to zero recording codes, where binarily

5 recorded "zeros" are represented by no (magnetic flux) change in the recording medium, while binary "ones" are represented by transitions from one direction of recorded flux to the opposite direction. In a (d, k) code, the above recording rules are maintained with the additional constraints that at least d "zeros" are recorded between successive data "ones", and no more

10 than k "zeros" are recorded between successive data "ones". The first constraint arises to obviate intersymbol interference occurring due to pulse crowding of the reproduced transitions when a series of "ones" are contiguously recorded. The second constraint arises in recovering a clock from the reproduced data by "locking" a phase locked loop to the reproduced

15 transitions. If there is too long an unbroken string of contiguous "zeros" with no interspersed "one"s, the clock regenerating phase-locked-loop will fall out of synchronism. In, for example, a (1,7) code there is at least one "zero" between recorded "ones", and there are no more than seven recorded contiguous "zeros" between recorded "ones". The series of encoded bits is

20 converted, *via* a modulo-2 integration operation, to a corresponding modulated signal formed by bit cells having a high or low signal value, a "one" bit being represented in the modulated signal by a change from a high to a low signal value or *vice versa*. A "zero" bit is represented by the lack of change of the modulated signal.

The "rate", i.e., the quotient of the number of bits in the information word and the code word, m/n , of the code is a parameter, which is a measure of its efficiency. The theoretical maximum rate of a code, given values of d and k , is called the Shannon capacity. FIGURE 1 tabulates the Shannon capacity

5 $C(d,k)$ for $d=1$ versus k . We may observe that for a $(1,7)$ code, the Shannon capacity, $C(1,7)$, has a value of 0.67929. This means that a code, generating sequences that comply with $d=1$, and $k=7$, cannot have a rate larger than 0.67929. The implementation of practical codes requires that the rate be a rational fraction, and the above $(1,7)$ code has a rate $2/3$. This rate, $2/3$, is
10 slightly less than the Shannon capacity, 0.67929, and the code is therefore a highly efficient one. To achieve the $2/3$ rate, 2 unconstrained data bits are mapped into 3 constrained encoded bits.

Rate $2/3$, $(1,7)$ codes and means for implementing associated encoders and
15 decoders are known in the art. U.S. Patent No. 4,413,251 entitled "Method and Apparatus for Generating A Noiseless Sliding Block Code for a $(1,7)$ Channel with Rate $2/3$ ", issued in the names of Adler *et al.*, discloses an encoder which is a finite-state machine having 5 internal states. U.S. Patent
No. 4,488,142 entitled "Apparatus for Encoding Unconstrained Data onto a
20 $(1,7)$ Format with Rate $2/3$ ", issued in the name of Franaszek discloses an encoder having 8 internal states.

Information recording has a constant need for enhancing the information density on the record carrier.

SUMMARY OF THE INVENTION

A possible solution to this is an increase of the rate of the code. It is an object of the invention to provide means for reducing the number of bit cells per
5 information word, and in particular, to an encoding and decoding apparatus that maps 9 unconstrained bits into 13 constrained bits. The code according to the invention is very efficient as its rate, $9/13=0.69231$, is only 0.2% below the Shannon capacity, $C(1, \infty)$. The code offers a rate which is 3.8% higher than that of the rate $2/3$, $(1,7)$ code. According to a first aspect of the invention this
10 object is achieved with a method as defined in the opening paragraph, characterized in that the sets of code words pertaining to the coding states do not have code words in common.

When the information words are converted into code words, a code word
15 belonging to a set of code words depending on the coding state is assigned to the information word to be converted. The r sets of code words belonging to the coding states S_1, \dots, S_r will henceforth be referenced V_1, \dots, V_r , respectively. The code words are distributed over one group of a first type and one group of a second type. The set of r coding states is divided into a subset
20 of a first type of coding states and a subset of a second type of coding states. The code words of the first type are allowed to enter any of the r encoder states, while code words of the second type are allowed to enter the subset of q first type of encoder states, where q is less than r . In other words, code words of the first type can be followed by any code word, while code words of

the second type can only be followed by code words that are associated with coding states of the first type.

- In the method and coding device according to the invention, the combination
- 5 of the same code word with code words from disjunct sets of code words establishes multiple unique bit combinations, so that more than one information word can be uniquely represented by the same code word in combination with the successive code word. A code word is followed by a code word of which it is always possible to establish unambiguously to what
- 10 set this next code word belongs. It is then possible with the code words from each of the disjunct sets to establish a sufficient number of unique bit combinations to represent all the information words. Code words of the first type may be followed by code words from any of the r encoder states, and can thus be allocated r times to different information words. Code words of the
- 15 second type can be followed by code words of a subset of q states and can thus be allocated q times in the same encoding set. Said measures provide a possibility of establishing a large number of unique bit combinations with code words having a relatively small number of bits per code word.
- 20 An embodiment for a decoding device of the type described above by which this is realized is characterized in that the converting unit is arranged for converting a code word to an information word also in dependence of the upcoming code word.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be further explained with reference to the following drawings in which:

5

Figure 1 tabulates the Shannon capacity $C(1,k)$ versus k ;

Figure 2 lists the allocation of subgroups of code words to states;

10 Figure 3 shows an embodiment of the invention;

Figures 4A-H show tables in which the relationship between the information words and code words is established.

15

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the preferred embodiment, a series of 9-bit information words are translated
20 into 13-bit code words. The series of code words obtained under the rules of translation satisfy the $d=1$ constraint. The preferred embodiment of the code has $r=5$ states, wherein the set of $r=5$ states is divided into two subsets of a first and second type of size 3 and 2, respectively. There is a requirement with respect to the code words of the first and second type that within the code
25 words the $(d=1)$ -constraint be satisfied. Code words of the first type end with

a '0', while code words of the second type end with a '1'. The group code words of the first type is divided into two subgroups, denoted by E00 and E10. The code words in subgroup E00 start and end with a '0', while code words in subgroup E10 start with a '1' and end with a '0'. In a similar fashion the group

5 of code words of the second type is divided into subgroups E11 and E01, where code words in subgroup E11 end and start with a '1', and code words in subgroup E01 start with a '0' and end with a '1'. In order to reduce the k-constraint, five code words, namely, '000000000000', '0000000000001', '1000000000000', '0100000000000', and '0000000000010' are barred from

10 the encoding tables. An enumeration of code words shows there are 230 code words in subgroup E00, 143 code words in subgroups E10 and E01, and 89 code words in subgroup E11. Code words that end with a '0', i.e. code words in subgroups E10 and E00, are allowed to enter any of the $r=5$ states, while code words that end with a '1' i.e., code words in subgroups E01 and E11, can

15 only enter the 3 states of the first type. All code words that leave states of the first type start with a '0'. The available code words in the various subgroups are distributed over the various states of the first and second type. FIG. 2 shows how, in the preferred embodiment, the code words in the various subgroups are allocated to the various states. For example, from FIG. 2, we

20 observe that the subgroup E00 of size 230 has 76 code words in States 1, 2, and 3 plus 1 code word in States 4 and 5.

It is essential that the sets of code words from which a selection is to be made do not have code words in common. As a result, it is possible to assign the

25 same code word from a set of code words to different information words. In

particular code words in subgroups E10 and E00 can be assigned 5 times to different information words, while code words in subgroups E11 and E01 can be assigned 3 times to different information words. For example, the total number of information words that can be assigned to the code words in State
5 1 is $5 \times 76 + 3 \times 44 = 512$. Similar arguments hold for the other states. It can be verified that from any of the $r=5$ encoders states there at least 512 information words that can be assigned to code words, which is enough to accommodate 9-bit information words. In the manner described above any random series of 9-bit information words can be uniquely converted to a series of code words

10

FIG. 3 shows an embodiment for an encoding device according to the invention. The coding device is arranged for converting the m -bit information words to the n -bit code words, where the number of different coding states can be represented by s bits. In the case $r=5$, s equals 3. The coding device
15 comprises a converter 50 for converting $(m+s)$ binary input signals to $(n+s)$ binary output signals. From the inputs of the converter 50, m inputs are connected to a bus 51 for receiving m -bit information words. From the outputs of the converter 50, n outputs are connected to a bus 52 for delivering n -bit code words. Furthermore, s inputs are connected to an s -bit bus 53 for
20 receiving a state word that indicates the instantaneous coding state. The state word is delivered by a buffer memory 54 comprising, for example, s flip-flops. The buffer memory 54 has s inputs connected to a bus 55 for receiving a state word to be loaded in the buffer memory 54. For delivering the state words to be loaded in the buffer memory 54, s outputs of the converter 50 are used.
25 Instead of comprising a ROM memory, the converter 50 may also comprise a

combinatorial logical circuit formed by gate circuits. Bus 52 is connected to the parallel inputs of a parallel-to-serial converter 56, which converts the code words received over bus 52 to a serial bit string to be supplied over a signal line 57 to a modulator circuit 58 which converts the bit string to the modulated
5 signal to be delivered over line 60. The modulator circuit 58 may be one of a customary type, for example, a modula-2 integrator. For the purpose of synchronization of the operations to be performed, the coding device shown in FIG. 3 comprises a clock generating circuit (not shown) of a customary type for generating clock signals for controlling the parallel/serial converter 58 and
10 for controlling the loading of the buffer memory 54.

FIG. 4A-H show the assignment of the 9-bit data words to the 13-bit codewords plus the new state as a function of the present state.

15 The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

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Claims

- 5 1. A method of encoding/decoding a sequence of binary data bits into a sequence of binary channel bits, wherein consecutive and sequential blocks of m data bits, where m an integer, are coded into sequential n -bit code words, where n an integer exceeding m , in accordance with a translation table, wherein the code words satisfy a dk -constraint such that
- 10 consecutive "1"s are separated by at least d and at most k "0"s, characterised in that the code words are distributed over one group of a first type and one group of a second type, wherein the set of coding states is distributed over one subset of the first type and one subset of the second type, wherein the code words of the first type are allowed to enter
- 15 encoder states of the first and second type, while code words of the second type are prohibited to enter states of the second type, while the sets of code words associated with the different coding states are disjunct.
2. A method of encoding a binary digital signal according to Claim 1, wherein
- 20 $d=1$ and the number of states equals 5 or 13.
3. A method of encoding a binary digital signal according to Claims 1 and 2, wherein $m=9$ and $n=13$.

4. A method of encoding a binary digital signal according to Claims 1 and 2,
wherein $m=11$ and $n=16$.
5. A method of encoding a binary digital signal according to Claims 1 and 2,
5 wherein $m=13$ and $n=19$.
6. A method of encoding a binary digital signal according to Claims 1 and 2,
wherein $m=15$ and $n=22$.
- 10 7. A coding device, comprising an m -to- n bit converter for converting m -bit
information words to n -bit code words, means for converting the n -bit code
words to a modulated signal, and state establishing means for establishing
a coding state on the delivery of a code word by the converter,
characterised in that the code words are distributed over one group of a
15 first type and one group of a second type, wherein the set of coding states
is distributed over one subset of a first type and one subset of a second
type, wherein the code words of the first type are allowed to enter encoder
states of the first and second type, while code words of the second type
are prohibited to enter states of type two, while the sets of code words
20 associated with the different coding states are disjunct.
8. Device as claimed in Claim 7 characterized in that d is equal to 1 and the
number of states equals 5 or 13.

9. Device as claimed in Claim 8 characterized in that $m=9$ and $n=13$, or $m=11$ and $n=16$, or $m=13$ and $n=19$, or $m=15$ and $n=22$.

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Abstract

A series of information words is converted into a modulated signal. For each
5 m-bit information word from the series, an n-bit code word is delivered. The
delivered code words are converted into the modulated signal. An m-bit
information word is translated into a code word using a table comprising sets
of code words that depend on the coding state established. The code words
are distributed over one group of a first type and one group of a second type.

10 The set of coding states is divided into one subset of a first type and one
subset of a second type. The sets of code words associated with the different
coding states are disjunct (=sets without common code words). The code
words of the first type are allowed to enter encoder states of the first type and
second type, while code words of the second type are prohibited to enter
15 states of the second type. In this coding method the number of unique
information words that can be assigned to code words is enlarged. The
modulated signal may be reconverted to information words by first converting
the modulated signal to a series of code words and then assigning an
information word to each of the code words in dependence of the code word
20 to be converted plus the upcoming code word in the series.

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Figure 1

K	$C(1, k)$
7	0.67929
8	0.68525
9	0.68879
Inf	0.69424

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Figure 2

subgroup	State 1	State 2	State 3	State 4	State 5
E00	76	76	76	1	1
E01	44	44	44	5	6
E10	0	0	0	72	71
E11	0	0	0	44	45

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Figure 3

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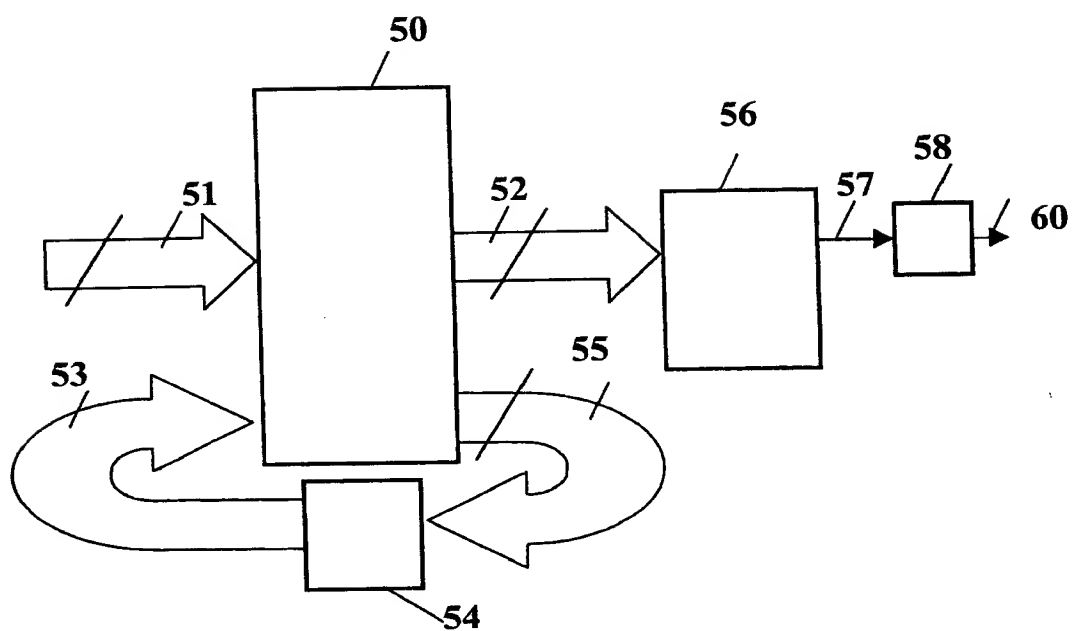


Figure 4A

	State 1		State 2		State 3		State 4		State 5		
5	Data bits	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
	0 000000000	000000000100	1 0001010000100	1 0100000101000	1 0101010101000	1 0101010101000	1 0101010101010	1			
	1 000000001	000000000100	2 0001010000100	2 0100000101000	2 0100000101000	2 0101010101000	2 0101010101010	2			
	2 000000010	000000000100	3 0001010000100	3 0100000101000	3 0100000101000	3 0101010101000	3 0101010101010	3			
	3 000000011	000000000100	4 0001010000100	4 0100000101000	4 0100000101000	4 0101010101000	4 0101010101010	4			
10	4 000000100	000000000100	5 0001010000100	5 0100000101000	5 0100000101000	5 0101010101000	5 0101010101010	5			
	5 000000101	0000000001000	1 0001010001000	1 0100000101010	1 0100000101010	1 0101001001001	1 0101010001001	1			
	6 000000110	0000000001000	2 0001010001000	2 0100000101010	2 0100000101010	2 0101001001001	2 0101010001001	2			
	7 000000111	0000000001000	3 0001010001000	3 0100000101010	3 0100000101010	3 0101001001001	3 0101010001001	3			
	8 000001000	0000000001000	4 0001010001000	4 0100000101010	4 0100000101010	4 0101001001001	4 0101010001001	4			
15	9 000001001	0000000001000	5 0001010001000	5 0100000101010	5 0100000101010	5 0101001001001	5 0101010001001	5			
	10 000001010	0000000001010	1 0001010001010	1 0100000100000	1 0100000100000	1 0101001001001	3 0101010001001	3			
	11 000001011	0000000001010	2 0001010001010	2 0100000100000	2 0100000100000	2 0101001001001	1 0101010001010	1			
	12 000001100	0000000001010	3 0001010001010	3 0100000100000	3 0100000100000	3 0101001001001	2 0101010001010	2			
	13 000001101	0000000001010	4 0001010001010	4 0100000100000	4 0100000100000	4 0101001001001	3 0101010001010	3			
20	14 000001110	0000000001010	5 0001010001010	5 0100000100000	5 0100000100000	5 0101010000001	1 0101010100001	1			
	15 000001111	0000000001000	1 0001010001000	1 0100000100001	1 0100000100001	1 0101010000001	2 0101010100001	2			
	16 000010000	0000000001000	2 0001010001000	2 0100000100001	2 0100000100001	2 0101010000001	3 0101010100001	3			
	17 000010001	0000000001000	3 0001010001000	3 0100000100001	3 0100000100001	3 0101010000010	1 0101010100010	1			
	18 000010010	0000000001000	4 0001010001000	4 0100000100001	4 0100000100001	4 0101010000010	2 0101010100010	2			
25	19 000010011	0000000001000	5 0001010001000	5 0100000100001	5 0100000100001	5 0101010000010	3 0101010100010	3			
	20 000010100	0000000001010	1 0001010001010	1 0100000100010	1 0100000100010	1 1000000000010	1 0101010101001	1			
	21 000010101	0000000001010	2 0001010001010	2 0100000100010	2 0100000100010	2 1000000000010	2 0101010101001	2			
	22 000010110	0000000001010	3 0001010001010	3 0100000100010	3 0100000100010	3 1000000000010	3 0101010101001	3			
	23 000010111	0000000001010	4 0001010001010	4 0100000100010	4 0100000100010	4 1000000000010	4 1001001010000	1			
30	24 000011000	0000000001010	5 0001010001010	5 0100000100010	5 0100000100010	5 1000000000010	5 1001001010000	2			
	25 000011001	0000000001010	1 0001010001010	1 0100000100100	1 1000000000010	1 1000000000010	1 1001001010000	3			
	26 000011010	0000000001010	2 0001010001010	2 0100000100100	2 0100000100100	2 1000000000010	2 1001001010000	4			
	27 000011011	0000000001010	3 0001010001010	3 0100000100100	3 0100000100100	3 1000000000010	3 1001001010000	5			
	28 000011100	0000000001010	4 0001010001010	4 0100000100100	4 0100000100100	4 1000000000010	4 1001001010010	1			
35	29 000011101	0000000001010	5 0001010001010	5 0100000100100	5 0100000100100	5 1000000000010	5 1001001010010	2			
	30 000011110	0000000001000	1 0001010100000	1 0100000100101	1 1000000000010	1 1000000000010	1 1001001010010	3			
	31 000011111	0000000001000	2 0001010100000	2 0100000100101	2 0100000100101	2 1000000000010	2 1001001010010	4			
	32 000100000	0000000001000	3 0001010100000	3 0100000100101	3 0100000100101	3 1000000000010	3 1001001010010	5			
40	33 000100001	0000000001000	4 0001010100000	4 0100000100101	4 1000000000010	4 1000000000010	4 1001001010010	1			
	34 000100010	0000000001000	5 0001010100000	5 0100000100101	5 1000000000010	5 1000000000010	5 1001001010010	2			
	35 000100011	00000000010010	1 0001010100010	1 0100000101000	1 1000000000010	1 1000000000010	1 1001001010100	3			
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55	49 000110001	00000000010100	5 0001010101000	5 0100000100100	5 1000000000010	5 1000000000010	5 1001010000100	2			
	50 000110010	00000000010101	1 0001010101010	1 0100000100000	1 1000000000010	1 1000000000010	1 1001010000100	3			
	51 000110011	00000000010101	2 0001010101010	2 0100000100000	2 1000000000010	2 1000000000010	2 1001010000100	4			
	52 000110100	00000000010101	3 0001010101010	3 0100000100000	3 1000000000010	3 1000000000010	3 1001010000100	5			
	53 000110101	00000000010101	4 0001010101010	4 0100000100000	4 0100000100000	4 1000000000010	4 1001010000100	1			
60	54 000110110	00000000010101	5 0001010101010	5 0100000100000	5 1000000000010	5 1000000000010	5 1001010000100	2			
	55 000110111	0000001000000	1 0010000000000	1 0100000100001	1 1000000000000	1 1000000000000	1 1001010000000	3			
	56 000111000	0000001000000	2 0010000000000	2 0100000100001	2 1000000000000	2 1000000000000	2 1001010000000	4			
	57 000111001	0000001000000	3 0010000000000	3 0100000100001	3 1000000000000	3 1000000000000	3 1001010000000	5			
	58 000111010	0000001000000	4 0010000000000	4 0100000100001	4 1000000000000	4 1000000000000	4 1001010000010	1			
65	59 000111011	0000001000000	5 0010000000000	5 0100000100001	5 1000000000000	5 1000000000000	5 1001010000010	2			
	60 000111100	0000001000010	1 0010000000010	1 0100000100001	1 1000000000001	1 1000000000001	1 1001010000010	3			
	61 000111101	0000001000010	2 0010000000010	2 0100000100001	2 1000000000001	2 1000000000001	2 1001010000010	4			
	62 000111110	0000001000010	3 0010000000010	3 0100000100001	3 1000000000001	3 1000000000001	3 1001010000010	5			
70	63 000111111	0000001000010	4 0010000000010	4 0100000100001	4 1000000000001	4 1000000000001	4 1001010000000	1			

Figure 4B

	Data bits	Channel bits	state Channel bits	state Channel bits	state Channel bits	state Channel bits	state
5	64	001000000	0000001000010	5 0010000000010	5 0100010000100	5 1000000100010	5 1001010010000 2
	65	001000001	0000001000100	1 0010000000010	1 0100010001000	1 1000000100100	1 1001010010000 3
	66	001000010	0000001000100	2 0010000000010	2 0100010001000	2 1000000100100	2 1001010010000 4
	67	001000011	0000001000100	3 0010000000010	3 0100010001000	3 1000000100100	3 1001010010000 5
	68	001000100	0000001000100	4 0010000000010	4 0100010001000	4 1000000100100	4 1001010010010 1
10	69	001000101	0000001000100	5 0010000000010	5 0100010001000	5 1000000100100	5 1001010010010 2
	70	001000110	0000001001000	1 0010000000100	1 0100010001010	1 1000000101000	1 1001010010010 3
	71	001000111	0000001001000	2 0010000000100	2 0100010001010	2 1000000101000	2 1001010010010 4
	72	001001000	0000001001000	3 0010000000100	3 0100010001010	3 1000000101000	3 1001010010010 5
	73	001001001	0000001001000	4 0010000000100	4 0100010001010	4 1000000101000	4 1001010010010 1
15	74	001001010	0000001001000	5 0010000000100	5 0100010001010	5 1000000101000	5 1001010010010 2
	75	001001011	0000001001010	1 0010000000101	1 0100010010000	1 1000000101010	1 1001010010010 3
	76	001001100	0000001001010	2 0010000000101	2 0100010010000	2 1000000101010	2 1001010010010 4
	77	001001101	0000001001010	3 0010000000101	3 0100010010000	3 1000000101010	3 1001010010010 5
	78	001001110	0000001001010	4 0010000000101	4 0100010010000	4 1000000101010	4 1001010100000 1
20	79	001001111	0000001001010	5 0010000000101	5 0100010010000	5 1000000101010	5 1001010100000 2
	80	001010000	0000001010000	1 0010000000100	1 0100010010010	1 1000001000000	1 1001010100000 3
	81	001010001	0000001010000	2 0010000000100	2 0100010010010	2 1000001000000	2 1001010100000 4
	82	001010010	0000001010000	3 0010000000100	3 0100010010010	3 1000001000000	3 1001010100000 5
	83	001010011	0000001010000	4 0010000000100	4 0100010010010	4 1000001000000	4 1001010100010 1
25	84	001010100	0000001010000	5 0010000000100	5 0100010010010	5 1000001000000	5 1001010100010 2
	85	001010101	0000001010010	1 0010000000101	1 0100010010010	1 1000001000010	1 1001010100010 3
	86	001010110	0000001010010	2 0010000000101	2 0100010010010	2 1000001000010	2 1001010100010 4
	87	001010111	0000001010010	3 0010000000101	3 0100010010010	3 1000001000010	3 1001010100010 5
	88	001011000	0000001010010	4 0010000000101	4 0100010010010	4 1000001000010	4 1001010100100 1
30	89	001011001	0000001010010	5 0010000000101	5 0100010010010	5 1000001000010	5 1001010100100 2
	90	001011010	0000001010100	1 0010000000100	1 0100010100000	1 1000001000100	1 1001010100100 3
	91	001011011	0000001010100	2 0010000000100	2 0100010100000	2 1000001000100	2 1001010100100 4
	92	001011100	0000001010100	3 0010000000100	3 0100010100000	3 1000001000100	3 1001010100100 5
	93	001011101	0000001010100	4 0010000000100	4 0100010100000	4 1000001000100	4 1001010101000 1
35	94	001011110	0000001010100	5 0010000000100	5 0100010100000	5 1000001000100	5 1001010101000 2
	95	001011111	0000010000000	1 0010000100000	1 0100010100010	1 1000001001000	1 1001010101000 3
	96	001100000	0000010000000	2 0010000100000	2 0100010100010	2 1000001001000	2 1001010101000 4
	97	001100001	0000010000000	3 0010000100000	3 0100010100010	3 1000001001000	3 1001010101000 5
	98	001100010	0000010000000	4 0010000100000	4 0100010100010	4 1000001001000	4 1001010101010 1
40	99	001100011	0000010000000	5 0010000100000	5 0100010100010	5 1000001001000	5 1001010101010 2
	100	001100100	0000010000010	1 0010000100010	1 0100010100100	1 1000001001010	1 1001010101010 3
	101	001100101	0000010000010	2 0010000100010	2 0100010100100	2 1000001001010	2 1001010101010 4
	102	001100110	0000010000010	3 0010000100010	3 0100010100100	3 1000001001010	3 1001010101010 5
	103	001100111	0000010000010	4 0010000100010	4 0100010100100	4 1000001001010	4 1010000000000 1
45	104	001101000	0000010000010	5 0010000100010	5 0100010100100	5 1000001001010	5 1010000000000 2
	105	001101001	0000010000010	1 0010000100010	1 0100010100010	1 1000001010000	1 1010000000000 3
	106	001101010	0000010000010	2 0010000100010	2 0100010100010	2 1000001010000	2 1010000000000 4
	107	001101011	0000010000010	3 0010000100010	3 0100010100010	3 1000001010000	3 1010000000000 5
	108	001101100	0000010000010	4 0010000100010	4 0100010100010	4 1000001010000	4 1010000000010 1
50	109	001101101	0000010000010	5 0010000100010	5 0100010100010	5 1000001010000	5 1010000000010 2
	110	001101110	0000010000010	1 0010000100010	1 0100010100101	1 1000001010010	1 1010000000010 3
	111	001101111	0000010000010	2 0010000100010	2 0100010100101	2 1000001010010	2 1010000000010 4
	112	001110000	0000010000010	3 0010000100010	3 0100010100101	3 1000001010010	3 1010000000010 5
	113	001110001	0000010000010	4 0010000100010	4 0100010100101	4 1000001010010	4 1010000000010 1
55	114	001110010	0000010000010	5 0010000100010	5 0100010100101	5 1000001010010	5 1010000000010 2
	115	001110011	0000010000010	1 0010000100101	1 0100010000000	1 1000001010100	1 1010000000010 3
	116	001110100	0000010000010	2 0010000100101	2 0100010000000	2 1000001010100	2 1010000000010 4
	117	001110101	0000010000010	3 0010000100101	3 0100010000000	3 1000001010100	3 1010000000010 5
	118	001110110	0000010000010	4 0010000100101	4 0100010000000	4 1000001010100	4 1010000000010 1
60	119	001110111	0000010000010	5 0010000100101	5 0100010000000	5 1000001010100	5 1010000000010 2
	120	001111000	0000010000000	1 0010001000000	1 0100010000010	1 1000010000000	1 1010000000000 3
	121	001111001	0000010000000	2 0010001000000	2 0100010000010	2 1000010000000	2 1010000000000 4
	122	001111010	0000010000000	3 0010001000000	3 0100010000010	3 1000010000000	3 1010000000000 5
	123	001111011	0000010000000	4 0010001000000	4 0100010000010	4 1000010000000	4 1010000000010 1
65	124	001111100	0000010000000	5 0010001000000	5 0100010000010	5 1000010000000	5 1010000000010 2
	125	001111101	0000010000010	1 0010001000010	1 0100010000010	1 1000010000010	1 1010000000010 3
	126	001111110	0000010000010	2 0010001000010	2 0100010000010	2 1000010000010	2 1010000000010 4
	127	001111111	0000010000010	3 0010001000010	3 0100010000010	3 1000010000010	3 1010000000010 5
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Figure 4C

	Data bits	Channel bits	state Channel bits	state Channel bits	state Channel bits	state Channel bits	state
5	128 01000000	0000010010010	4 0010001000010	4 0100100000100	4 1000010000010	4 1010000010000	1
	129 01000000	0000010010010	5 0010001000010	5 0100100000100	5 1000010000010	5 1010000010000	2
	130 01000001	0000010010100	1 0010001000010	1 0100100000100	1 1000010000010	1 1010000010000	3
	131 01000001	0000010010100	2 0010001000010	2 0100100000100	2 1000010000010	2 1010000010000	4
	132 01000010	0000010010100	3 0010001000010	3 0100100000100	3 1000010000010	3 1010000010000	5
10	133 01000010	0000010010100	4 0010001000010	4 0100100000100	4 1000010000010	4 1010000010010	1
	134 01000011	0000010010100	5 0010001000010	5 0100100000100	5 1000010000010	5 1010000010010	2
	135 01000011	0000010100000	1 0010001001000	1 0100100000101	1 1000010001000	1 1010000010010	3
	136 01000100	0000010100000	2 0010001001000	2 0100100000101	2 1000010001000	2 1010000010010	4
	137 01000100	0000010100000	3 0010001001000	3 0100100000101	3 1000010001000	3 1010000010010	5
15	138 01000101	0000010100000	4 0010001001000	4 0100100000101	4 1000010001000	4 1010000010100	1
	139 01000101	0000010100000	5 0010001001000	5 0100100000101	5 1000010001000	5 1010000010100	2
	140 01000110	0000010100010	1 0010001001010	1 0100100010000	1 1000010001010	1 1010000010100	3
	141 01000110	0000010100010	2 0010001001010	2 0100100010000	2 1000010001010	2 1010000010100	4
	142 01000111	0000010100010	3 0010001001010	3 0100100010000	3 1000010001010	3 1010000010100	5
20	143 01000111	0000010100010	4 0010001001010	4 0100100010000	4 1000010001010	4 1010000010000	1
	144 01001000	0000010100010	5 0010001001010	5 0100100010000	5 1000010001010	5 1010000010000	2
	145 01001000	0000010100100	1 0010001010000	1 0100100010010	1 1000010010000	1 1010000010000	3
	146 01001001	0000010100100	2 0010001010000	2 0100100010010	2 1000010010000	2 1010000010000	4
	147 01001001	0000010100100	3 0010001010000	3 0100100010010	3 1000010010000	3 1010000010000	5
25	148 01001010	0000010100100	4 0010001010000	4 0100100010010	4 1000010010000	4 1010000010010	1
	149 01001010	0000010100100	5 0010001010000	5 0100100010010	5 1000010010000	5 1010000010010	2
	150 01001011	0000010101000	1 0010001010010	1 0100100010100	1 1000010010010	1 1010000010010	3
	151 01001011	0000010101000	2 0010001010010	2 0100100010100	2 1000010010010	2 1010000010010	4
	152 01001000	0000010101000	3 0010001010010	3 0100100010100	3 1000010010010	3 1010000010010	5
30	153 01001001	0000010101000	4 0010001010010	4 0100100010100	4 1000010010010	4 1010000010010	1
	154 01001010	0000010101000	5 0010001010010	5 0100100010100	5 1000010010010	5 1010000010010	2
	155 01001011	0000010101010	1 0010001010100	1 0100100100000	1 1000010010100	1 1010000010010	3
	156 01001100	0000010101010	2 0010001010100	2 0100100100000	2 1000010010100	2 1010000010010	4
	157 01001101	0000010101010	3 0010001010100	3 0100100100000	3 1000010010100	3 1010000010010	5
35	158 01001110	0000010101010	4 0010001010100	4 0100100100000	4 1000010010100	4 1010000010010	1
	159 01001111	0000010101010	5 0010001010100	5 0100100100000	5 1000010010100	5 1010000010010	2
	160 01010000	0000100000000	1 0010010000000	1 0100100100010	1 1000010100000	1 1010000010000	3
	161 01010001	0000100000000	2 0010010000000	2 0100100100010	2 1000010100000	2 1010000010000	4
	162 01010010	0000100000000	3 0010010000000	3 0100100100010	3 1000010100000	3 1010000010000	5
40	163 01010001	0000100000000	4 0010010000000	4 0100100100010	4 1000010100000	4 1010000010010	1
	164 01010010	0000100000000	5 0010010000000	5 0100100100010	5 1000010100000	5 1010000010010	2
	165 01010011	0000100000010	1 0010010000010	1 0100100100010	1 1000010100010	1 1010000010010	3
	166 01010011	0000100000010	2 0010010000010	2 0100100100010	2 1000010100010	2 1010000010010	4
	167 01010011	0000100000010	3 0010010000010	3 0100100100010	3 1000010100010	3 1010000010010	5
45	168 01010100	0000100000010	4 0010010000010	4 0100100100010	4 1000010100010	4 1010000010000	1
	169 01010101	0000100000010	5 0010010000010	5 0100100100010	5 1000010100010	5 1010000010000	2
	170 01010101	0000100000100	1 0010010000100	1 0100100100010	1 1000010100010	1 1010000010000	3
	171 01010101	0000100000100	2 0010010000100	2 0100100100010	2 1000010100010	2 1010000010000	4
	172 01010101	0000100000100	3 0010010000100	3 0100100100010	3 1000010100010	3 1010000010000	5
50	173 01010110	0000100000100	4 0010010000100	4 0100100100010	4 1000010100010	4 1010000010000	1
	174 01010110	0000100000100	5 0010010000100	5 0100100100010	5 1000010100010	5 1010000010000	2
	175 01010111	0000100000100	1 0010010000100	1 0100100100101	1 1000010100010	1 1010000010000	3
	176 01010100	0000100000100	2 0010010000100	2 0100100100101	2 1000010100010	2 1010000010000	4
	177 01010101	0000100000100	3 0010010000100	3 0100100100101	3 1000010100010	3 1010000010000	5
55	178 01010010	0000100000100	4 0010010000100	4 0100100100101	4 1000010100010	4 1010000010000	1
	179 01010011	0000100000100	5 0010010000100	5 0100100100101	5 1000010100010	5 1010000010000	2
	180 01010100	0000100000101	1 0010010000101	1 0100101000000	1 1000010100101	1 1010000010000	3
	181 01010101	0000100000101	2 0010010000101	2 0100101000000	2 1000010100101	2 1010000010000	4
	182 01010110	0000100000101	3 0010010000101	3 0100101000000	3 1000010100101	3 1010000010000	5
60	183 01010111	0000100000101	4 0010010000101	4 0100101000000	4 1000010100101	4 1010000010000	1
	184 01011100	0000100000101	5 0010010000101	5 0100101000000	5 1000010100101	5 1010000010000	2
	185 01011001	000010000010000	1 0010010010000	1 0100101000010	1 1000100000000	1 1010000010000	3
	186 01011010	000010000010000	2 0010010010000	2 0100101000010	2 1000100000000	2 1010000010000	4
	187 01011011	000010000010000	3 0010010010000	3 0100101000010	3 1000100000000	3 1010000010000	5
65	188 01011100	000010000010000	4 0010010010000	4 0100101000010	4 1000100000000	4 1010000010010	1
	189 01011101	000010000010000	5 0010010010000	5 0100101000010	5 1000100000000	5 1010000010010	2
	190 01011110	000010000010010	1 0010010010010	1 0100101000010	1 1000100000010	1 1010000010010	3
	191 01011111	000010000010010	2 0010010010010	2 0100101000010	2 1000100000010	2 1010000010010	4

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Figure 4D

	Data bits	Channel bits	state Channel bits	state Channel bits	state Channel bits	state Channel bits	state
5	192 011000000	0000100010010	3 0010010010010	3 0100101000100	3 1000100000010	3 1010001001010	5
	193 011000001	0000100010010	4 0010010010010	4 0100101000100	4 1000100000010	4 1010001010000	1
	194 011000010	0000100010010	5 0010010010010	5 0100101000100	5 1000100000010	5 1010001010000	2
	195 011000011	0000100010100	1 0010010010100	1 0100101000100	1 1000100000100	1 1010001010000	3
	196 011000100	0000100010100	2 0010010010100	2 0100101000100	2 1000100000100	2 1010001010000	4
10	197 011000101	0000100010100	3 0010010010100	3 0100101000100	3 1000100000100	3 1010001010000	5
	198 011000110	0000100010100	4 0010010010100	4 0100101000100	4 1000100000100	4 1010001010010	1
	199 011000111	0000100010100	5 0010010010100	5 0100101000100	5 1000100000100	5 1010001010010	2
	200 011001000	0000100100000	1 0010010100000	1 0100101000101	1 1000100001000	1 1010001010010	3
	201 011001001	0000100100000	2 0010010100000	2 0100101000101	2 1000100001000	2 1010001010010	4
	202 011001010	0000100100000	3 0010010100000	3 0100101000101	3 1000100001000	3 1010001010010	5
15	203 011001011	0000100100000	4 0010010100000	4 0100101000101	4 1000100001000	4 1010001010100	1
	204 011001100	0000100100000	5 0010010100000	5 0100101000101	5 1000100001000	5 1010001010100	2
	205 011001101	0000100100010	1 0010010100010	1 0100101010000	1 1000100001010	1 1010001010100	3
	206 011001110	0000100100010	2 0010010100010	2 0100101010000	2 1000100001010	2 1010001010100	4
20	207 011001111	0000100100010	3 0010010100010	3 0100101010000	3 1000100001010	3 1010001010100	5
	208 011010000	0000100100010	4 0010010100010	4 0100101010000	4 1000100001010	4 1010010000000	1
	209 011010001	0000100100010	5 0010010100010	5 0100101010000	5 1000100001010	5 1010010000000	2
	210 011010010	0000100100100	1 0010010100100	1 0100101010010	1 1000100010000	1 1010010000000	3
	211 011010011	0000100100100	2 0010010100100	2 0100101010010	2 1000100010000	2 1010010000000	4
25	212 011010100	0000100100100	3 0010010100100	3 0100101010010	3 1000100010000	3 1010010000000	5
	213 011010101	0000100100100	4 0010010100100	4 0100101010010	4 1000100010000	4 1010010000010	1
	214 011010110	0000100100100	5 0010010100100	5 0100101010010	5 1000100010000	5 1010010000010	2
	215 011010111	0000100101000	1 0010010101000	1 0100101010100	1 1000100010010	1 1010010000010	3
30	216 011011000	0000100101000	2 0010010101000	2 0100101010100	2 1000100010010	2 1010010000010	4
	217 011011001	0000100101000	3 0010010101000	3 0100101010100	3 1000100010010	3 1010010000010	5
	218 011011010	0000100101000	4 0010010101000	4 0100101010100	4 1000100010010	4 1010010000100	1
	219 011011011	0000100101000	5 0010010101000	5 0100101010100	5 1000100010010	5 1010010000100	2
	220 011011100	0000100101010	1 0010010101010	1 0101000000000	1 1000100010100	1 1010010000100	3
	221 011011101	0000100101010	2 0010010101010	2 0101000000000	2 1000100010100	2 1010010000100	4
35	222 011011110	0000100101010	3 0010010101010	3 0101000000000	3 1000100010100	3 1010010000100	5
	223 011011111	0000100101010	4 0010010101010	4 0101000000000	4 1000100010100	4 1010010000100	1
	224 011100000	0000100101010	5 0010010101010	5 0101000000000	5 1000100010100	5 1010010000100	2
	225 011100001	0000101000000	1 0010100000000	1 0101000000010	1 1000100100000	1 1010010000100	3
40	226 011100010	0000101000000	2 0010100000000	2 0101000000010	2 1000100100000	2 1010010000100	4
	227 011100011	0000101000000	3 0010100000000	3 0101000000010	3 1000100100000	3 1010010000100	5
	228 011100100	0000101000000	4 0010100000000	4 0101000000010	4 1000100100000	4 10100100001010	1
	229 011100101	0000101000000	5 0010100000000	5 0101000000010	5 1000100100000	5 10100100001010	2
45	230 011100110	0000101000010	1 0010100000010	1 0101000000010	1 1000100100010	1 10100100001010	3
	231 011100111	0000101000010	2 0010100000010	2 0101000000010	2 1000100100010	2 10100100001010	4
	232 011101000	0000101000010	3 0010100000010	3 0101000000010	3 1000100100010	3 10100100001010	5
	233 011101001	0000101000010	4 0010100000010	4 0101000000010	4 1000100100010	4 1010010010000	1
	234 011101010	0000101000010	5 0010100000010	5 0101000000010	5 1000100100010	5 1010010010000	2
	235 011101011	0000101000010	1 0010100000010	1 0101000001000	1 1000100100010	1 1010010010000	3
50	236 011101100	0000101000010	2 0010100000010	2 0101000001000	2 1000100100010	2 1010010010000	4
	237 011101101	0000101000010	3 0010100000010	3 0101000001000	3 1000100100010	3 1010010010000	5
	238 011101110	0000101000010	4 0010100000010	4 0101000001000	4 1000100100010	4 1010010010010	1
	239 011101111	0000101000010	5 0010100000010	5 0101000001000	5 1000100100010	5 1010010010010	2
55	240 011110000	0000101000010	1 0010100000010	1 0101000001010	1 1000100100010	1 1010010010010	3
	241 011110001	0000101000010	2 0010100000010	2 0101000001010	2 1000100100010	2 1010010010010	4
	242 011110010	0000101000010	3 0010100000010	3 0101000001010	3 1000100100010	3 1010010010010	5
	243 011110011	0000101000010	4 0010100000010	4 0101000001010	4 1000100100010	4 1010010010010	1
	244 011110100	0000101000010	5 0010100000010	5 0101000001010	5 1000100100010	5 1010010010010	2
	245 011110101	0000101000010	1 00101000001010	1 0101000001000	1 10001001001010	1 1010010010010	3
60	246 011110110	0000101000010	2 00101000001010	2 0101000001000	2 10001001001010	2 1010010010010	4
	247 011110111	0000101000010	3 00101000001010	3 0101000001000	3 10001001001010	3 1010010010010	5
	248 011111000	0000101000010	4 00101000001010	4 0101000001000	4 10001001001010	4 1010010100000	1
	249 011111001	0000101000010	5 00101000001010	5 0101000001000	5 10001001001010	5 1010010100000	2
	250 011111010	0000101010000	1 00101000010000	1 01010000010010	1 1000101000000	1 1010010100000	3
65	251 011111011	0000101010000	2 00101000010000	2 01010000010010	2 1000101000000	2 1010010100000	4
	252 011111100	0000101010000	3 00101000010000	3 01010000010010	3 1000101000000	3 1010010100000	5
	253 011111101	0000101010000	4 00101000010000	4 01010000010010	4 1000101000000	4 1010010100010	1
	254 011111110	0000101010000	5 00101000010000	5 01010000010010	5 1000101000000	5 1010010100010	2
70	255 011111111	0000101010010	1 00101000010010	1 01010000010100	1 1000101000010	1 1010010100010	3

Figure 4E

	Data bits	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	
5	256	100000000	0000101010010	2	00101000010010	2	01010000010100	2	1000101000010	4
	257	100000001	0000101010010	3	00101000010010	3	01010000010100	3	1000101000010	5
	258	100000010	0000101010010	4	00101000010010	4	01010000010100	4	1000101000010	1
	259	100000011	0000101010010	5	00101000010010	5	01010000010100	5	1000101000010	2
	260	100000100	0000101010100	1	00101000010100	1	01010000100000	1	10001010000100	3
10	261	100000101	0000101010100	2	00101000010100	2	01010000100000	2	10001010000100	4
	262	100000110	0000101010100	3	00101000010100	3	01010000100000	3	10001010000100	5
	263	100000111	0000101010100	4	00101000010100	4	01010000100000	4	10001010000100	1
	264	100001000	0000101010100	5	00101000010100	5	01010000100000	5	10001010000100	2
	265	100001001	0001000000000	1	00101000010000	1	01010000100000	1	10001010000100	3
15	266	100001010	0001000000000	2	00101000010000	2	01010000100000	2	10001010000100	4
	267	100001011	0001000000000	3	00101000010000	3	01010000100000	3	10001010000100	5
	268	100001100	0001000000000	4	00101000010000	4	01010000100000	4	10001010000100	1
	269	100001101	0001000000000	5	00101000010000	5	01010000100000	5	10001010000100	2
	270	100001110	0001000000010	1	00101000010001	1	01010000100010	1	100010100001010	3
20	271	100001111	0001000000010	2	00101000010001	2	01010000100010	2	100010100001010	4
	272	100010000	0001000000010	3	00101000010001	3	01010000100010	3	100010100001010	5
	273	100010001	0001000000010	4	00101000010001	4	01010000100010	4	100010100000000	1
	274	100010010	0001000000010	5	00101000010001	5	01010000100010	5	100010100000000	2
	275	100010011	00010000000100	1	00101000010010	1	01010000100010	1	1000101010000	3
25	276	100010100	0001000000100	2	00101000010010	2	01010000100000	2	1000101010000	4
	277	100010101	0001000000100	3	00101000010010	3	01010000100000	3	1000101010000	5
	278	100010110	0001000000100	4	00101000010010	4	01010000100000	4	1000101010000	1
	279	100010111	0001000000100	5	00101000010010	5	01010000100000	5	1000101010000	2
	280	100011000	00010000001000	1	00101000010010	1	01010000100010	1	1000101010010	3
30	281	100011001	00010000001000	2	00101000010010	2	01010000100010	2	1000101010010	4
	282	100011010	00010000001000	3	00101000010010	3	01010000100010	3	1000101010010	5
	283	100011011	00010000001000	4	00101000010010	4	01010000100010	4	1000101010010	1
	284	100011100	00010000001000	5	00101000010010	5	01010000100010	5	1000101010010	2
	285	100011101	00010000001010	1	00101000010010	1	01010000100000	1	1000101010100	3
35	286	100011110	00010000001010	2	00101000010010	2	01010000100000	2	1000101010100	4
	287	100011111	00010000001010	3	00101000010010	3	01010000100000	3	1000101010100	5
	288	100100000	00010000001010	4	00101000010010	4	01010000100000	4	1000101010100	1
	289	100100001	00010000001010	5	00101000010010	5	01010000100000	5	1000101010100	2
	290	100100010	00010000001000	1	00101000001000	1	01010000000000	1	10001000000000	3
40	291	100100011	00010000001000	2	00101000001000	2	01010000000000	2	10001000001000	4
	292	100100100	00010000001000	3	00101000001000	3	01010000000000	3	10001000001000	5
	293	100100101	00010000001000	4	00101000000000	4	01010000000000	4	10001000001010	1
	294	100100110	00010000001000	5	00101000000000	5	01010000000000	5	10001000001010	2
	295	100100111	000100000010010	1	00101000000010	1	01010000000000	1	10001000001010	3
45	296	100101000	000100000010010	2	00101000000010	2	01010000000000	2	10001000001010	4
	297	100101001	000100000010010	3	00101000000010	3	01010000000000	3	10001000001010	5
	298	100101010	000100000010010	4	00101000000010	4	01010000000000	4	10001000001000	1
	299	100101011	000100000010010	5	00101000000010	5	01010000000000	5	10001000001000	2
	300	100101100	000100000010100	1	00101000000010	1	01010000000000	1	10001000001000	3
50	301	100101101	000100000010100	2	00101000000010	2	01010000000000	2	10001000001000	4
	302	100101110	000100000010100	3	00101000000010	3	01010000000000	3	10001000001000	5
	303	100101111	000100000010100	4	00101000000010	4	01010000000000	4	100010000010010	1
	304	100110000	000100000010100	5	00101000000010	5	01010000000000	5	100010000010010	2
	305	100110001	000100000000000	1	00101000000000	1	01010000000000	1	100010000010010	3
55	306	100110010	000100000000000	2	00101000000000	2	01010000000000	2	100010000010010	4
	307	100110011	000100000000000	3	00101000000000	3	01010000000000	3	100010000010010	5
	308	100110100	000100000000000	4	00101000000000	4	01010000000000	4	100010000010100	1
	309	100110101	000100000000000	5	00101000000000	5	01010000000000	5	100010000010100	2
	310	100110110	000100000000010	1	001010000000010	1	01010000000000	1	100010000010100	3
60	311	100110111	000100000000010	2	001010000000010	2	01010000000000	2	100010000010100	4
	312	100111000	000100000000010	3	001010000000010	3	01010000000000	3	100010000010100	5
	313	100111001	000100000000010	4	001010000000010	4	01010000000000	4	100010000010000	1
	314	100111010	000100000000010	5	001010000000010	5	01010000000000	5	100010000010000	2
	315	100111011	000100000000100	1	00101000000000	1	01010000000000	1	100010000010000	3
65	316	100111100	000100000000100	2	00101000000000	2	01010000000000	2	100010000010000	4
	317	100111101	000100000000100	3	00101000000000	3	01010000000000	3	100010000010000	5
	318	100111110	000100000000100	4	00101000000000	4	01010000000000	4	100010000010010	1
	319	100111111	000100000000100	5	00101000000000	5	01010000000000	5	100010000010010	2

Figure 4F

	Data bits	Channel bits	state Channel bits	state Channel bits	state Channel bits	state Channel bits	state
5	320	101000000	0001000101000	1 0010101010010	1 0101001010100	1 1001000010010	1 1010100100010 3
	321	101000001	0001000101000	2 0010101010010	2 0101001010100	2 1001000010010	2 1010100100010 4
	322	101000010	0001000101000	3 0010101010010	3 0101001010100	3 1001000010010	3 1010100100010 5
	323	101000011	0001000101000	4 0010101010010	4 0101001010100	4 1001000010010	4 1010100100010 1
	324	101000100	0001000101000	5 0010101010010	5 0101001010100	5 1001000010010	5 1010100100010 2
10	325	101000101	0001000101010	1 0010101010100	1 0101010000000	1 1001000010100	1 1010100100010 3
	326	101000110	0001000101010	2 0010101010100	2 0101010000000	2 1001000010100	2 1010100100010 4
	327	101000111	0001000101010	3 0010101010100	3 0101010000000	3 1001000010100	3 1010100100010 5
	328	101001000	0001000101010	4 0010101010100	4 0101010000000	4 1001000010100	4 1010100100010 1
	329	101001001	0001000101010	5 0010101010100	5 0101010000000	5 1001000010100	5 1010100100010 2
15	330	101001010	0001001000000	1 0100000000010	1 0101010000010	1 1001000100000	1 1010100100000 3
	331	101001011	0001001000000	2 0100000000010	2 0101010000010	2 1001000100000	2 1010100100000 4
	332	101001100	0001001000000	3 0100000000010	3 0101010000010	3 1001000100000	3 1010100100000 5
	333	101001101	0001001000000	4 0100000000010	4 0101010000010	4 1001000100000	4 1010100100010 1
	334	101001110	0001001000000	5 0100000000010	5 0101010000010	5 1001000100000	5 1010100100010 2
20	335	101001111	0001001000010	1 0100000000100	1 0101010000100	1 1001000100010	1 1010100100010 3
	336	101010000	0001001000010	2 0100000000100	2 0101010000100	2 1001000100010	2 1010100100010 4
	337	101010001	0001001000010	3 0100000000100	3 0101010000100	3 1001000100010	3 1010100100010 5
	338	101010010	0001001000010	4 0100000000100	4 0101010000100	4 1001000100010	4 1010100100010 1
	339	101010011	0001001000010	5 0100000000100	5 0101010000100	5 1001000100010	5 1010100100010 2
25	340	101010100	0001001000010	1 0100000001000	1 0101010001000	1 1001000100100	1 1010101000000 3
	341	101010101	0001001000010	2 0100000001000	2 0101010001000	2 1001000100100	2 1010101000000 4
	342	101010110	0001001000010	3 0100000001000	3 0101010001000	3 1001000100100	3 1010101000000 5
	343	101010111	0001001000010	4 0100000001000	4 0101010001000	4 1001000100100	4 1010101000010 1
	344	101011000	0001001000010	5 0100000001000	5 0101010001000	5 1001000100100	5 1010101000010 2
30	345	101011001	0001001000010	1 0100000001010	1 0101010001010	1 1001000100100	1 1010101000010 3
	346	101011010	0001001000010	2 0100000001010	2 0101010001010	2 1001000100100	2 1010101000010 4
	347	101011011	0001001000010	3 0100000001010	3 0101010001010	3 1001000100100	3 1010101000010 5
	348	101011100	0001001000010	4 0100000001010	4 0101010001010	4 1001000100100	4 1010101000010 1
	349	101011101	0001001000010	5 0100000001010	5 0101010001010	5 1001000100100	5 1010101000010 2
35	350	101011110	0001001000010	1 0100000010000	1 0101010010000	1 1001000101010	1 1010101000010 3
	351	101011111	0001001000010	2 0100000010000	2 0101010010000	2 1001000101010	2 1010101000010 4
	352	101100000	0001001000010	3 0100000010000	3 0101010010000	3 1001000101010	3 1010101000010 5
	353	101100001	0001001000010	4 0100000010000	4 0101010010000	4 1001000101010	4 1010101000010 1
	354	101100010	0001001000010	5 0100000010000	5 0101010010000	5 1001000101010	5 1010101000010 2
40	355	101100011	0001001000010	1 0100000010010	1 0101010010010	1 1001000100000	1 1010101000000 3
	356	101100100	0001001000000	2 0100000010010	2 0101010010010	2 1001000100000	2 1010101000000 4
	357	101100101	0001001000000	3 0100000010010	3 0101010010010	3 1001000100000	3 1010101000000 5
	358	101100110	0001001000000	4 0100000010010	4 0101010010010	4 1001000100000	4 1010101000010 1
	359	101100111	0001001000000	5 0100000010010	5 0101010010010	5 1001000100000	5 1010101000010 2
45	360	101101000	0001001000010	1 0100000010100	1 0101010010100	1 1001000100000	1 1010101000010 3
	361	101101001	0001001000010	2 0100000010100	2 0101010010100	2 1001000100000	2 1010101000010 4
	362	101101010	0001001000010	3 0100000010100	3 0101010010100	3 1001000100000	3 1010101000010 5
	363	101101011	0001001000010	4 0100000010100	4 0101010010100	4 1001000100000	4 1010101000010 1
	364	101101100	0001001000010	5 0100000010100	5 0101010010100	5 1001000100000	5 1010101000010 2
50	365	101101101	0001001000010	1 0100000010000	1 0101010010000	1 1001000100010	1 1010101000010 3
	366	101101110	0001001000010	2 0100000010000	2 0101010010000	2 1001000100010	2 1010101000010 4
	367	101101111	0001001000010	3 0100000010000	3 0101010010000	3 1001000100010	3 1010101000010 5
	368	101110000	0001001000010	4 0100000010000	4 0101010010000	4 1001000100010	4 1010101000010 1
	369	101110001	0001001000010	5 0100000010000	5 0101010010000	5 1001000100010	5 1010101000010 2
55	370	101110010	0001010000000	1 0100000010000	1 0101010010000	1 1001000100000	1 1010101000010 3
	371	101110011	0001010000000	2 0100000010000	2 0101010010000	2 1001000100000	2 1010101000010 4
	372	101110100	0001010000000	3 0100000010000	3 0101010010000	3 1001000100000	3 1010101000010 5
	373	101110101	0001010000000	4 0100000010000	4 0101010010000	4 1001000100000	4 1010101000010 1
	374	101110110	0001010000000	5 0100000010000	5 0101010010000	5 1001000100000	5 1010101000010 2
60	375	101110111	0001010000000	1 0100000010010	1 0101010010010	1 1001000100010	1 1010101000010 3
	376	101111000	0001010000000	2 0100000010010	2 0101010010010	2 1001000100010	2 1010101000010 4
	377	101111001	0001010000000	3 0100000010010	3 0101010010010	3 1001000100010	3 1010101000010 5
	378	101111010	0001010000000	4 0100000010010	4 0101010010010	4 1001000100010	4 1010101000010 1
	379	101111011	0001010000000	5 0100000010010	5 0101010010010	5 1001000100010	5 1010101000010 2
65	380	101111100	0000000000010	1 0001001010001	1 0100000000001	1 1000000000001	1 1001001000010 3
	381	101111101	0000000000010	2 0001001010001	2 0100000000001	2 1000000000001	2 1001001000010 4
	382	101111110	0000000000010	3 0001001010001	3 0100000000001	3 1000000000001	3 1001001000010 5
	383	101111111	0000000000010	1 0001001010101	1 0100000000010	1 1000000000010	1 1001001000010 3

Figure 4G

	Data bits	Channel bits	state Channel bits	state Channel bits	state Channel bits	state Channel bits	state
5	384	110000000	000000001001	2 0001001010101	2 0100000000101	2 1000000000101	2 1001001010101 1
	385	110000001	000000001001	3 0001001010101	3 0100000000101	3 1000000000101	3 1001001010101 2
	386	110000010	0000000010001	1 0001010000001	1 0100000000101	1 1000000000101	1 1001001010101 3
	387	110000011	0000000010001	2 0001010000001	2 0100000000101	2 1000000000101	2 1001010000001 1
	388	110000100	0000000010001	3 0001010000001	3 0100000000101	3 1000000000101	3 1001010000001 2
	389	110000101	0000000010101	1 0001010000101	1 0100000010001	1 1000000010001	1 1001010000001 3
10	390	110000110	0000000010101	2 0001010000101	2 0100000010001	2 1000000010001	2 1001010000101 1
	391	110000111	0000000010101	3 0001010000101	3 0100000010001	3 1000000010001	3 1001010000101 2
	392	110001000	0000000100001	1 0001010001001	1 0100000010101	1 1000000010101	1 1001010000101 3
	393	110001001	0000000100001	2 0001010001001	2 0100000010101	2 1000000010101	2 1001010000101 1
	394	110001010	0000000100001	3 0001010001001	3 0100000010101	3 1000000010101	3 1001010000101 2
15	395	110001011	0000000100101	1 0001010010001	1 0100000100001	1 1000000100001	1 1001010010001 3
	396	110001100	0000000100101	2 0001010010001	2 0100000100001	2 1000000100001	2 1001010010001 1
	397	110001101	0000000100101	3 0001010010001	3 0100000100001	3 1000000100001	3 1001010010001 2
	398	110001110	0000000101001	1 0001010010101	1 0100000100101	1 1000000100101	1 1001010010001 3
	399	110001111	0000000101001	2 0001010010101	2 0100000100101	2 1000000100101	2 1001010010101 1
20	400	110010000	0000000101001	3 0001010010101	3 0100000100101	3 1000000100101	3 1001010010101 2
	401	110010001	0000000100001	1 0001010100001	1 0100000101001	1 1000000101001	1 1001010010101 3
	402	110010010	0000000100001	2 0001010100001	2 0100000101001	2 1000000101001	2 1001010100001 1
	403	110010011	0000000100001	3 0001010100001	3 0100000101001	3 1000000101001	3 1001010100001 2
	404	110010100	00000001000101	1 00010101000101	1 01000001000001	1 10000001000001	1 10010101000001 3
25	405	110010101	00000001000101	2 00010101000101	2 01000001000001	2 10000001000001	2 10010101000101 1
	406	110010110	00000001000101	3 00010101000101	3 01000001000001	3 10000001000001	3 10010101000101 2
	407	110010111	00000001001001	1 0001010101001	1 01000001000101	1 10000001000101	1 10010101000101 3
	408	110011000	00000001001001	2 0001010101001	2 01000001000101	2 10000001000101	2 1001010101001 1
	409	110011001	00000001001001	3 0001010101001	3 01000001000101	3 10000001000101	3 1001010101001 2
30	410	110011010	0000000100001	1 00010000000001	1 01000001001001	1 10000001001001	1 1001010101001 3
	411	110011011	00000001010001	2 00100000000001	2 01000001001001	2 10000001001001	2 10100000000001 1
	412	110011100	00000001010001	3 00100000000001	3 01000001001001	3 10000001001001	3 10100000000001 2
	413	110011101	00000001010101	1 00100000000101	1 01000001010001	1 10000001010001	1 10100000000001 3
	414	110011110	00000001010101	2 00100000000101	2 01000001010001	2 10000001010001	2 10100000000101 1
35	415	110011111	00000001010101	3 00100000000101	3 01000001010001	3 10000001010001	3 10100000000101 2
	416	110100000	00000100000001	1 00100000001001	1 01000001010101	1 10000001010101	1 10100000000101 3
	417	110100001	00000100000001	2 00100000001001	2 01000001010101	2 10000001010101	2 10100000000101 1
	418	110100010	00000100000001	3 00100000001001	3 01000001010101	3 10000001010101	3 10100000000101 2
	419	110100011	00000100000101	1 00100000010001	1 01000000000001	1 10000000000001	1 10100000000101 3
40	420	110100100	00000100000101	2 00100000010001	2 01000000000001	2 10000000000001	2 10100000000101 1
	421	110100101	00000100000101	3 00100000010001	3 01000000000001	3 10000000000001	3 10100000000101 2
	422	110100110	00000100000101	1 00100000010101	1 01000000000101	1 10000000000101	1 10100000000001 3
	423	110100111	00000100000101	2 00100000010101	2 01000000000101	2 10000000000101	2 10100000000101 1
	424	110101000	00000100000101	3 00100000010101	3 01000000000101	3 10000000000101	3 10100000000101 2
45	425	110101001	00000100000101	1 00100000010001	1 01000000000101	1 10000000000101	1 10100000000101 3
	426	110101010	00000100000101	2 00100000010001	2 01000000000101	2 10000000000101	2 10100000000001 1
	427	110101011	00000100000101	3 00100000010001	3 01000000000101	3 10000000000101	3 10100000000001 2
	428	110101100	00000100010101	1 00100000010101	1 01000000000101	1 10000000000101	1 10100000000001 3
	429	110101101	00000100010101	2 00100000010101	2 01000000000101	2 10000000000101	2 10100000000101 1
50	430	110101110	00000100010101	3 00100000010101	3 01000000000101	3 10000000000101	3 10100000000101 2
	431	110101111	00000101000001	1 00100000010101	1 01000000000101	1 10000000000101	1 10100000000001 3
	432	110110000	00000101000001	2 00100000010101	2 01000000000101	2 10000000000101	2 10100000000101 1
	433	110110001	00000101000001	3 00100000010101	3 01000000000101	3 10000000000101	3 10100000000101 2
	434	110110010	00000101000101	1 00100000000001	1 01000000000001	1 10000000000001	1 10100000000001 3
55	435	110110011	00000101000101	2 00100000000001	2 01000000000001	2 10000000000001	2 10100000000001 1
	436	110110100	00000101000101	3 00100000000001	3 01000000000001	3 10000000000001	3 10100000000001 2
	437	110110101	00000101010001	1 00100000000101	1 01000000000101	1 10000000000101	1 10100000000001 3
	438	110110110	00000101010001	2 00100000000101	2 01000000000101	2 10000000000101	2 10100000000001 1
	439	110110111	00000101010001	3 00100000000101	3 01000000000101	3 10000000000101	3 10100000000001 2
60	440	110111000	00001000000001	1 00100000000101	1 01000000000101	1 10000000000101	1 10100000000001 3
	441	110111001	00001000000001	2 00100000000101	2 01000000000101	2 10000000000101	2 10100000000001 1
	442	110111010	00001000000001	3 00100000000101	3 01000000000101	3 10000000000101	3 10100000000001 2
	443	110111011	00001000000001	1 00100000000101	1 01000000000001	1 10000000000001	1 10100000000001 3
	444	110111100	00001000000001	2 00100000000101	2 01000000000001	2 10000000000001	2 10100000000001 1
65	445	110111101	00001000000001	3 00100000000101	3 01000000000001	3 10000000000001	3 10100000000001 2
	446	110111110	00001000000001	1 00100000000101	1 01000000000001	1 10000000000001	1 10100000000001 3
	447	110111111	00001000000001	2 00100000000101	2 01000000000001	2 10000000000001	2 10100000000001 1

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Figure 4H

		Data bits	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state	Channel bits	state
5	448	111000000	0000100001001	3	0010001010101	3	0100100000101	3	1000100000101	3	1010001010101	2
	449	111000001	0000100010001	1	0010010000001	1	0100100000101	1	1000100000101	1	1010001010101	3
	450	111000010	0000100010001	2	0010010000001	2	0100100000101	2	1000100000101	2	1010010000001	1
	451	111000011	0000100010001	3	0010010000001	3	0100100000101	3	1000100000101	3	1010010000001	2
	452	111000100	0000100010101	1	0010010000010	1	0100100001001	1	1000100001001	1	1010010000001	3
10	453	111000101	0000100010101	2	0010010000010	2	0100100001001	2	1000100001001	2	1010010000010	1
	454	111000110	0000100010101	3	0010010000010	3	0100100001001	3	1000100001001	3	1010010000010	2
	455	111000111	0000100100001	1	0010010000101	1	0100100001010	1	1000100001010	1	1010010000101	3
	456	111001000	0000100100001	2	0010010000101	2	0100100001010	2	1000100001010	2	1010010000101	1
	457	111001001	0000100100001	3	0010010000101	3	0100100001010	3	1000100001010	3	1010010000101	2
15	458	111001010	0000100100101	1	0010010010001	1	0100100100001	1	1000100100001	1	1010010000101	3
	459	111001011	0000100100101	2	0010010010001	2	0100100100001	2	1000100100001	2	1010010010001	1
	460	111001100	0000100100101	3	0010010010001	3	0100100100001	3	1000100100001	3	1010010010001	2
	461	111001101	0000100101001	1	0010010010101	1	0100100100101	1	1000100100101	1	1010010010001	3
	462	111001110	0000100101001	2	0010010010101	2	0100100100101	2	1000100100101	2	1010010010101	1
20	463	111001111	0000100101001	3	0010010010101	3	0100100100101	3	1000100100101	3	1010010010101	2
	464	111010000	0000101000001	1	0010010100001	1	0100100101001	1	1000100101001	1	1010010010101	3
	465	111010001	0000101000001	2	0010010100001	2	0100100101001	2	1000100101001	2	1010010100001	1
	466	111010010	0000101000001	3	0010010100001	3	0100100101001	3	1000100101001	3	1010010100001	2
	467	111010011	0000101000101	1	0010010100010	1	0100101000001	1	1000101000001	1	1010010100001	3
25	468	111010100	0000101000101	2	0010010100010	2	0100101000001	2	1000101000001	2	1010010100010	1
	469	111010101	0000101000101	3	0010010100101	3	0100101000001	3	1000101000001	3	1010010100101	2
	470	111010110	0000101001001	1	0010010101001	1	0100101000010	1	1000101000010	1	1010010100101	3
	471	111010111	0000101001001	2	0010010101001	2	0100101000010	2	1000101000010	2	1010010101001	1
	472	111011000	0000101001001	3	0010010101001	3	0100101000010	3	1000101000010	3	1010010101001	2
30	473	111011001	0000101010001	1	0010100000001	1	0100010100101	1	1000101001001	1	1010010101001	3
	474	111011010	0000101010001	2	0010100000001	2	0100101001001	2	1000101001001	2	1010010000001	1
	475	111011011	0000101010001	3	0010100000001	3	0100101001001	3	1000101001001	3	1010100000001	2
	476	111011100	0000101010101	1	0010100000101	1	0100010101001	1	1000101010001	1	1010100000001	3
	477	111011101	0000101010101	2	0010100000101	2	0100101010001	2	1000101010001	2	1010100000010	1
35	478	111011110	0000101010101	3	0010100000101	3	0100101010001	3	1000101010001	3	1010100000101	2
	479	111011111	0001000000001	1	0010100000101	1	0100010101010	1	1000101010101	1	1010100000101	3
	480	111100000	0001000000001	2	0010100000101	2	0100010101010	2	1000101010101	2	1010100000101	1
	481	111100001	0001000000001	3	0010100000101	3	0100010101010	3	1000101010101	3	1010100000101	2
	482	111100010	0001000000101	1	0010100001001	1	0101000000001	1	1001000000001	1	1010100001001	3
40	483	111100011	0001000000101	2	0010100001001	2	0101000000001	2	1001000000001	2	1010100001001	1
	484	111100100	0001000000101	3	0010100001001	3	0101000000001	3	1001000000001	3	1010100001001	2
	485	111100101	0001000000101	1	0010100001010	1	0101000000010	1	1001000000010	1	1010100001001	3
	486	111100110	0001000000101	2	0010100001010	2	0101000000010	2	1001000000010	2	1010100001010	1
	487	111100111	0001000000101	3	0010100001010	3	0101000000010	3	1001000000010	3	1010100001010	2
45	488	111101000	0001000001001	1	0010100010001	1	0101000001001	1	1001000001001	1	1010100001010	3
	489	111101001	0001000001001	2	0010100010001	2	0101000001001	2	1001000001001	2	1010100001010	1
	490	111101010	0001000001001	3	0010100010001	3	0101000001001	3	1001000001001	3	1010100001010	2
	491	111101011	0001000001010	1	0010100010010	1	0101000001001	1	1001000001001	1	1010100000001	3
	492	111101100	0001000001010	2	0010100010010	2	0101000001001	2	1001000001001	2	1010100000001	1
50	493	111101101	0001000001010	3	0010100010010	3	0101000001001	3	1001000001001	3	1010100000001	2
	494	111101110	0001000001001	1	0010100010101	1	0101000001010	1	1001000001010	1	1010100001010	3
	495	111101111	0001000001001	2	0010100010101	2	0101000001010	2	1001000001010	2	1010100001010	1
	496	111110000	0001000001001	3	0010100010101	3	0101000001010	3	1001000001010	3	1010100001010	2
	497	111110001	0001000001010	1	0010101000001	1	0101000001001	1	1001000001001	1	1010100001001	3
55	498	111110010	0001000001010	2	0010101000001	2	0101000001001	2	1001000001001	2	1010100000001	1
	499	111110011	0001000001010	3	0010101000001	3	0101000001001	3	1001000001001	3	1010100000001	2
	500	111110100	0001000001001	1	0010101000010	1	0101000001001	1	1001000001001	1	1010101000001	3
	501	111110101	0001000001001	2	0010101000010	2	0101000001001	2	1001000001001	2	1010101000010	1
	502	111110110	0001000001001	3	0010101000010	3	0101000001001	3	1001000001001	3	1010101000010	2
60	503	111110111	0001001000001	1	0010101001001	1	0101000001010	1	1001000001010	1	1010101000010	3
	504	111111000	0001001000001	2	0010101001001	2	0101000001010	2	1001000001010	2	1010101000010	1
	505	111111001	0001001000001	3	0010101001001	3	0101000001010	3	1001000001010	3	1010101000010	2
	506	111111010	0001001000001	1	0010101010001	1	0101001000001	1	1001001000001	1	1010101000010	3
	507	111111011	0001001000001	2	0010101010001	2	0101001000001	2	1001001000001	2	1010101000010	1
65	508	111111100	0001001000001	3	0010101010001	3	0101001000001	3	1001001000001	3	1010101000010	2
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	510	111111110	0001001001001	2	0010101010101	2	0101001000010	2	1001001000010	2	1010101010101	1
	511	111111111	0001001001001	3	0010101010101	3	0101001000010	3	1001001000010	3	1010101010101	2